In the Claims

The following is a complete listing of the claims and replace all prior claims in the application:

1. (Withdrawn) A method for forming self-pinned abutted junction heads, comprising:

forming a first self-pinned layer having a first magnetic orientation, the first layer having a first end, a second end and central portion;

forming a second self-pinned layer over only the central portion of the first self-pinned layer, an interlayer being disposed between the first and second self-pinned layers;

forming a free layer in a central region over the second self-pinned layer; and

forming a first and second hard bias layers over the first and second ends of the first self-pinned layer respectively, the first and second hard bias layer abutting the free layer, the first and second end of the first self-pinned layer extending under the hard bias layers at the first and second ends.

2. (Withdrawn) The method of claim 1 further comprising forming a spacer layer over the first self-pinned layer and forming a first and second seed layer between the first and second hard bias layer and the spacer layer.

3. (Withdrawn) The method of claim 2 further comprising forming amorphous layers between the spacer and the first and second seed layers, the amorphous layer stopping epitaxial growth between the first self-pinned layer and the first and second hard bias layers.

4. (Withdrawn) The method of claim 1 further comprising forming amorphous layers between the first self-pinned layer and the first and second hard bias layers for stopping epitaxial growth between the first self-pinned layer and the first and second hard bias layers.

5. (Withdrawn) The method of claim 1 further comprising forming first and second leads over the first and second hard bias layers.

6. (Withdrawn) The method of claim 1, wherein the forming the first and second hard bias layers further comprises electrically coupling the first and second hard bias layers to the free layer to allow sense current to pass through the free layer.

7. (Withdrawn) The method of claim 1, wherein forming the first and second hard bias layers over the first self-pinned layer further comprises providing a coupling of the self-pinned layers and the free layer to the first and second hard bias layers, the first and second hard bias layers being cooler than the central region to maintain pinning of the first and second hard bias layers, the maintenance of the pinning of the first and second hard bias layers maintaining the pinning of the free layer.

8. (Withdrawn) The method of claim 1, wherein the forming the free layer further comprises forming the free layer with a length selected for a desired track width.

9. (Currently Amended) A self-pinned abutted junction magnetic read sensor, comprising:

a first self-pinned layer having a first magnetic orientation, the first self-pinned layer having a first end, a second end and central portion, the first and second end of the first self-pinned layer having a side surface, top surface and bottom surface;

a second self-pinned layer formed over only the central portion of the first self-pinned layer, an interlayer being disposed between the first and second self-pinned layers;

a free layer formed in a central region over the second self-pinned layer; and

a first and second hard bias layers formed over the top surface of the first and second ends of the first self-pinned layer respectively, the first and second hard bias layer abutting the free layer, the top surface of the first and second end of the first self-pinned layer extending under the hard bias layers ~~at the first and second ends and contacting the hard bias layer along the top surface of the first and second ends of the first self-pinned layer~~.

10. (Previously Presented) The sensor of claim 9 further comprising a spacer layer formed over the first self-pinned layer and a first and second seed layer disposed between the first and second hard bias layer and the spacer layer.

11. (Previously Presented) The sensor of claim 10 further comprising amorphous layers formed between the spacer and the first and second seed layers, the amorphous layer stopping epitaxial growth between the first self-pinned layer and the first and second hard bias layers.

12. (Previously Presented) The sensor of claim 9 further comprising amorphous layers formed between the first self-pinned layer and the first and second hard bias layers for stopping epitaxial growth between the first self-pinned layer and the first and second hard bias layers.

13. (Previously Presented) The sensor of claim 9 further comprising first and second leads formed over the first and second hard bias layers.

14. (Previously Presented) The sensor of claim 9, wherein the first and second hard bias layers are electrically coupled to the free layer to allow sense current to pass through the free layer.

15. (Previously Presented) The sensor of claim 9, wherein the first and second hard bias layers are cooler than the central region to providing stable pinning of the free layer.

16. (Previously Presented) The sensor of claim 9, wherein the free layer includes a length selected for a desired track width.

17. (Currently Amended) A magnetic storage system, comprising:

a moveable magnetic storage medium for storing data thereon;

an actuator positionable relative to the moveable magnetic storage medium; and

a magnetoresistive sensor, coupled to the actuator, for reading data from the magnetic recording medium when position to a desired location by the actuator, wherein the magnetoresistive sensor further comprises:

a first self-pinned layer having a first magnetic orientation, the first self-pinned layer having a first end, a second end and central portion, the first and second end of the first self-pinned layer having a side surface, top surface and bottom surface;

a second self-pinned layer formed over only the central portion of the first self-pinned layer, an interlayer being disposed between the first and second self-pinned layers;

a free layer formed in a central region over the second self-pinned layer; and

a first and second hard bias layers formed over the top surface of the first and second ends of the first self-pinned layer respectively, the first and second hard bias layer abutting the free layer, the top surface of the first and second end of the first self-pinned layer extending under the hard bias layers ~~at the first and second ends and contacting the hard bias layer along the top surface of the first and second ends of the first self-pinned layer~~.

18. (Previously Presented) The magnetic storage system of claim 17 further comprising a spacer layer formed over the first self-pinned layer and a first and second seed layer disposed between the first and second hard bias layer and the spacer layer.

19. (Previously Presented) The magnetic storage system of claim 18 further comprising amorphous layers formed between the spacer and the first and second seed layers, the amorphous layer stopping epitaxial growth between the first self-pinned layer and the first and second hard bias layers.

20. (Previously Presented) The magnetic storage system of claim 17 further comprising amorphous layers formed between the first self-pinned layer and the first and second hard bias layers for stopping epitaxial growth between the first self-pinned layer and the first and second hard bias layers.

21. (Previously Presented) The magnetic storage system of claim 17 further comprising first and second leads formed over the first and second hard bias layers.

22. (Previously Presented) The magnetic storage system of claim 17, wherein the first and second hard bias layers are electrically coupled to the free layer to allow sense current to pass through the free layer.

23. (Previously Presented) The magnetic storage system of claim 17, wherein the first and second hard bias layers are cooler than the central region to providing stable pinning of the free layer.

24. (Previously Presented) The magnetic storage system of claim 17, wherein the free layer includes a length selected for a desired track width.

25. (Currently Amended) A self-pinned abutted junction magnetic read sensor, comprising:

a first means for providing a first self-pinned layer having a first magnetic orientation, the first means having a first end, a second end and central portion, the first and second end of the first self-pinned layer having a side surface, top surface and bottom surface;

second means for providing a second self-pinned layer formed over only the central portion of the first means, an interlayer being disposed between the first and second means;

a third means for providing a free layer formed in a central region over the second means; and

a fourth and fifth means for providing first and second hard bias layers, the fourth and fifth means being formed over the top surface of the first and second ends of the first means respectively, the first and second means abutting the third means, the top surface of the first and second end of the first means extending under the fourth and fifth means ~~at the first and second ends and contacting the fourth and fifth means along the top surface of the first and second ends of the first means~~.

26. (Currently Amended) A magnetic storage system, comprising:

a moveable magnetic storage means for storing data thereon;

an actuator positionable relative to the moveable magnetic storage medium; and

a magnetoresistive sensor, coupled to the actuator, for reading data from the magnetic recording medium when position to a desired location by the actuator, wherein the magnetoresistive sensor further comprises:

a first means for providing a first self-pinned layer having a first magnetic orientation, the first means having a first end, a second end and central portion, the first and second end of the first self-pinned layer having a side surface, top surface and bottom surface;

second means for providing a second self-pinned layer formed over only the central portion of the first means, an interlayer being disposed between the first and second means;

a third means for providing a free layer formed in a central region over the second means; and

a fourth and fifth means for providing first and second hard bias layers, the fourth and fifth means being formed over the top surface of the first and second ends of the first means respectively, the first and second means abutting the third means, the top surface of the first and second end of the first means extending under the fourth and fifth means ~~at the first and second ends and contacting the fourth and fifth means along the top surface of the first and second ends of the first means~~.